Variation in Trillium grandiflorum, Salisb. / [H.W. Britcher].

H. W. Britcher

Maine Agricultural Experiment Station

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VARIATION IN TRILLIUM GRANDIFLORUM

SALISB.

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VARIATION IN TRILLIUM GRANDIFLORUM.

H. W. Britcher.

To all those who have cultivated vegetable or flower gardens it has probably been a matter of frequent observation that, in any bed composed of plants all of the same sort, there have been individual differences or variations. Some of the plants have been more vigorous growers than others and have come to earlier maturity. In some of the plants the flowers have been uniformly of larger size or perhaps have shown a tendency to be double or in some other way differ from the flowers of the rest of the plants. The horticulturist, growing plants in large quantities, has a much wider field of observation. When he finds a plant exhibiting a slight variation which he considers of value he carefully saves the seed and from it raises another generation of plants, some of which will show the variation in intensified form. From such plants another generation is raised and the process is repeated until the variation becomes fixed, that is, until the desired character is present in all the plants raised from the selected seed. This is known as artificial selection and is one of the ways in which new and improved varieties are produced. Propagation from sports, or plants in which variations become fixed in a single generation, is another method and hybridization is still another. By these methods most of our cultivated crops of the present day have been developed or artificially evolved from, in most cases, pactically worthless ancestors. In his book entitled "The Evolution of Our Native Fruits," Professor Bailey says: "The American grapes have given rise to eight hundred domestic varieties, the American plums to more than two hundred, the raspberries to three hundred and various other native fruits have a long cultivated progeny."

In "Animals and Plants Under Domestication" Darwin presented a vast amount of material on artificial selection, and in

his "Origin of Species" he showed how by natural selection, the slight variations normally occurring in nature would be magnified until, in the course of ages, several distinct species would result from a single ancestor and differ from that ancestor even more than they differ among themselves. Several instances showing how extensive may be the variations in a single wild species have been given by Wallace in his book entitled "Darwinism." Such differences among individuals of a species in a state of nature are much commoner than the indifferent observer would believe, but are well known to those who, in studying carefully small groups of either plants or animals, have been brought in contact with large numbers of individuals of the same species. Within recent years the results of several such studies of variations have appeared in the scientific periodicals and the main purpose of this article is to present in tabular form the size and color variations found in a number of individuals of the common white trillium or large-flowered wake-robin.

The tendency of *Trillium grandiflorum* to exhibit variations of the sort known as phyllody, or the reversion of flower parts to leaves, is well known to botanists. Professor Charles A. Davis read a paper on the subject at the meeting of the American Association for the Advancement of Science in 1897 and exhibited a large number of specimens collected in Michigan. Mrs. L. L. Goodrich, a well-known botanist of Syracuse, has studied the same phenomenon at considerable length and has found that the variations persist even after removal of the plants to a suitable place in the garden. The results of part of her work were very briefly and unostentatiously noted a few years ago in "Meehan's Monthly." The occurrence of the same phenomenon in other localities has occasionally been brought to the notice of some scientific society so that the present account can lay no claim to novelty. However, it is thought worth while to record in permanent form the actual measurements of various parts of a series of plants exhibiting different degrees of this sort of variation, which, as soon as it materially affects the essential organs of the plant, namely the stamens and pistils, prevents the formation of seed by the plant. This of course stops the direct propagation of the more abnormal forms by the method of seed selection. It is conceivable, however, that such forms

may be increased by natural division of the rootstocks of the two-stemmed individuals, and perhaps also by cross pollination, as in many of the very abnormal forms one or more of the stamens produce pollen, which is probably potent. In fact among the plants examined, in only five flowers was it noted that none of the stamens were pollen bearing.

The plants here described were collected near Syracuse, N. Y., in a wood of second-growth timber. The soil, which overlies a limestone formation and which is more or less intermixed with limestone rocks, is a rich leaf-mould on top and a compact clay loam beneath. The rootstocks usually rest on the clay and most of the roots penetrate into it. The richness of the locality in trillium individuals is only poorly shown by the first illustration. In a strip of territory hardly a quarter of a mile wide and less than a mile long normal plants occur by the hundreds of thousands and abnormal ones by thousands. At some spots barely half a dozen abnormal forms can be found among a thousand plants, while at a nearby spot from ten to fifteen out of every hundred will show coloration of the petals with the accompanying variations of the other parts. On the whole, probably at least one per cent of the plants shows abnormal variation.

While the measurements given indicate approximately the size of each part, they do not of course indicate the shape of the outline. This varies to some extent in the cases of the leaf blades and sepals, but very conspicuously so in the case of the petals. Thus, as the photographs and table of measurements show, plants 13 and 143 have petals more than three times as long as they are wide, while numbers 22 and 31 are nearly as broad as they are long. Numbers 84, 105 and 163*a* are just as broad as long, while 163*b* is broader than long. But, however much the outline may vary, the petal never loses its pointed tip. In some of the specimens examined it was in a deeper notch than shown in plants 111 and 22. It comes more nearly being obliterated in extremely broad-petaled plants of the normal sort, such as number 12, than its does in any of the greatly abnormal varieties.

In the following table all the measurements are in millimeters, the greatest width of the organ being given first and then the length. When two figures are given in the column "Length of ovary," the first refers to the length of the stalk or stem upon

which in such specimens the ovary is placed, and the second refers to the length of the ovary proper, as indicated usually by a slight swelling.

In the column "Color of petal" the size of the green centre stripe is frequently given and also its position (proximally or distally) when it is not approximately in the centre of the petal. When the green stripe is rather narrow it usually does not extend to either the base or the tip of the petal.

ABBREVIATIONS.

b. border, referring to a space from two to four millimeters wide along the margin of the petal. *c.* centre. *dis.* distally, referring to the distal part of the petal. *ed.* edge, referring to a space not more than one millimeter wide along the margin of the petal. *gr.* green. *lt.* light. *m.* margin, referring to a space from four to six millimeters wide along the margin of the petal. *pr.* proximally, referring to the proximal or basal part of the petal. *wh.* white.

NOTES.

1-14. Typical plants, showing ordinary slight variations of the different parts.

15-17. Plants with petioled leaves, all the other parts being typical.

18-129. Abnormal plants, showing variation in petal coloration and in structure of parts.

22. Length of petioles 76, 81 and 86 mm.

24. The green centre stripes on the petals are 10, 14 and 18 mm. wide.

25. The green centre stripes on the petals are 12, 14 and 22 mm. wide.

26. The third petal is smaller than the others, the stem being 14 mm. long and the blade 18x30 mm. in size; two stamens are aborted, the others having filaments 14, 10, 8 and 4 mm. long and anthers 9, 9, 5 and 0 mm. long.

27. Two stamens are aborted.

28. Two leaves are reduced to spurs 2 mm. long.

29. All the leaves are aborted.

30. One petal is entirely white, one has a trace of green along its centre distally and the other has a green stripe 3 mm. wide along the centre.

31. All the leaves are reduced to spurs 1 mm. long at the tip of the rootstock.

32. All the leaves are reduced to spurs 3 mm. long and one petal has a white border distally.

36. Two petals are entirely white.

37. One petal is entirely white.

49. One petal has a green centre 22x26 mm. in size.

55. One petal has a green centre 2x16 mm. in size.

65. Four stamens have filaments only 2 mm. long and anthers aborted.

67. Five stamens have filaments only 3 mm. long and anthers aborted.

71. All the leaves are reduced to spurs 4 mm. long.

73. One petal is entirely white, one has a green centre 1 x 15 mm. in size and the other has a green centre 2 x 30 mm. in size.

74. One petal is entirely white, one has a green centre 1 x 12 mm. in size and the third has a green centre 2 x 14 mm. in size.

92. One leaf is reduced to a spur 1 mm. long. There are only two sepals, which are opposite and two petals, also opposite. One stamen is 11 mm. long and 4 mm. wide and is white edged.

104. Three stamens have filaments only 2 mm. long and anthers aborted.

106. One petal is reduced to a spur 3 mm. long.

108. Four stamens are aborted.

109. Two stamens have filaments 6 mm. long and anthers aborted. The ovary is stalked.

111. Two leaves are reduced to spurs.

120. Five stamens have filaments 10 mm. long and anthers aborted.

121. One stamen is aborted.

122. One leaf has the petiole 135 mm. long and the blade 40 x 60 mm. in size. The stamens of the outer whorl have filaments 14, 28 and 4 mm. long and anthers 6, 8 and 0 mm. long, while those of the inner whorl have filaments 30, 28 and 24 mm. long and anthers 8, 8 and 7 mm. long.

123. One leaf is reduced to a spur 4 mm. long.

124. The stamens of the outer whorl have filaments 6, 12 and 18 mm. long and anthers 6, 8 and 8 mm. long, while those of the inner whorl have filaments 9, 13 and 21 mm. long and anthers 8, 8 and 10 mm. long.

127. Two leaves entirely aborted. There are only two sepals which are opposite and two petals, also opposite: two stamens aborted.

128. The place of the ovary is taken by three leaf-like parts with stems 10 mm. long and blades 5 x 14 mm. in size. Within this circle are two pollen bearing stamens with filaments 4 and 7 mm. long and anthers 5 and 10 mm. long.

129. In this plant the sepals are marked with white, one being two-thirds white, one being one-half white and one having a white edge along one side proximally.

130-133. Typical plants in which a single rootstock gives rise to two stems.

134-180. Abnormal plants in which a single rootstock gives rise to two stems.

141 *a*. One petal has a stem 6 mm. long and a blade 16 x 30 mm. in size.

143 *b*. One petal is entirely white.

144 *b*. Two petals are green at their bases and white distally.

146 *a*. All the leaves are reduced to spurs 3 mm. long.

b. All parts above the leaves are aborted.

147 *a*. Two leaves are reduced to spurs.

b. One leaf is reduced to a spur and all parts above leaves are aborted.

148 *a*. One stamen is aborted and two of the others have filaments 13 and 6 mm. long and anthers 8 and 8 mm. long. Pistil aborted.

b. One stamen has the filament 12 mm. long and the anther 9 mm. long. Pistil aborted. Leaves in both *a* and *b* are reduced to spurs 1 mm. long.

149 *a*. All the leaves are reduced to spurs.

b. Only one leaf present, the other two being mere spurs.

151 *a*. This flower has twelve stamens each with a filament 7 mm. long and an anther 8 mm. long.

152 *a*. The sepals are red and green and the place of the petals is taken by three stamens having red filaments 6 mm. long and green anthers 6 mm. long.

b. The sepals are red-veined and interpolated between the sepals and petals are six extra stamens, green in color and having filaments 5 mm. long and anthers 8 mm. long.

164 *a*. Five stamens have light green filaments only 2 mm. long and anthers aborted.

165 *b*. Four stamens aborted.

166 *a*. Two stamens aborted.

175 *a*. Only two leaves are present, the blades of which are 43 x 52 mm. and 35 x 56 mm. in size. There are only two sepals which are opposite and two petals, also opposite.

176 *b*. Three stamens with filaments 6 mm. long and anthers aborted.

177 *b*. Two leaves reduced to spurs and three stamens with filaments 2 mm. long and anthers aborted.

178 *a*. Only three stamens, which are green in color and have filaments 29, 20 and 9 mm. long and anthers 10, 10 and 0 mm. long.

181. A typical plant in which the rootstock sends up three stems.

182-185. Abnormal plants in which the rootstock sends up three stems.

184 *a*. Five stamens have filaments 3 mm. long and anthers aborted.

b. The third leaf has the petiole 38 mm. long and the blade 34 x 44 mm. in size.

c. The place of the third leaf is taken by two leaves having a common petiole 4 mm. long and separate petioles 50 and 46 mm. long and blades 23 x 38 mm. and 26 x 44 mm. in size.

185 *a*. One petal has a green stripe 5 mm. wide along one margin.

b. One petal has four yellowish green veins, one is notched at one side and the notch has a yellow pollen bearing edge backed by a green line, and the third petal is lacking, its space being left open.

c. Only two sepals, the space of the third being open. Only two petals which are opposite. One of them is 37 x 44 mm. in size and entirely white. The other is 48 x 54 mm. in size and has directly over the open sepal space a green stripe 26 x 54 mm. in size. Within this green stripe is a white stripe 3 x 54 mm. in size. Two of the stamens have their filaments fused and their anthers fused for 4 mm., the remaining 10 mm. of the anthers being separate.

Number.	Length of stem.	Length of petiole.	Size of leaf blade.	Length of peduncle.	Length of sepal stem.	Size of sepal blade.	Length of petal stem.	Size of petal blade.
1	180	.....	80×90	63	.....	18×46	.....	33×50
2	210	.....	67×95	44	.....	13×33	.....	26×47
3	225	.....	80×95	70	.....	18×54	.....	46×80
4	235	.....	65×100	50	.....	10×38	.....	20×54
5	275	.....	95×115	73	.....	18×48	.....	34×58
6	290	.....	78×115	62	.....	16×48	.....	28×72
7	305	.....	94×118	64	.....	16×47	.....	30×64
8	325	.....	85×120	64	.....	13×58	.....	30×62
9	340	.....	113×157	93	.....	20×56	.....	37×74
10	220	.....	84×84	60	.....	20×38	.....	36×50
11	240	.....	100×124	84	.....	26×58	.....	40×74
12	230	.....	86×100	53	.....	14×36	.....	30×49
13	250	.....	67×98	47	.....	10×36	.....	18×50
14	265	.....	105×113	60	.....	21×50	.....	40×68
15	130	22	54×90	80	.....	17×49	.....	25×60
16	145	6	46×76	50	.....	14×40	.....	19×54
17	295	2	68×105	50	.....	12×44	.....	17×56
18	130	50	90×96	75	.....	33×70	14	48×60
19	162	2	42×56	30	.....	11×26	.....	22×34
20	115	20	50×80	28	4	20×44	12	22×42
21	115	4	36×50	12	.....	15×34	4	24×34
22	65	81	35×54	118	.....	20×40	8	30×34
23	175	18	42×62	54	.....	17×40	7	26×44
24	335	.....	110×140	72	.....	25×58	.....	46×68
25	210	22	90×98	90	.....	24×48	.....	46×60
26	35	90	46×60	85	14	26×45	22	25×40
27	87	12	46×52	18	.....	18×34	6	19×32
28	18	60	32×45	95	.....	20×37	3	22×37
29	2	.....	spurs	155	.....	30×63	22	38×54
30	165	5	74×79	62	.....	24×42	.....	32×52
31	.....	.....	spurs	168	.....	28×60	12	45×50
32	60	.....	spurs	106	.....	30×57	8	32×50
33	230	10	96×98	70	.....	30×60	.....	46×62
34	195	10	68×86	56	.....	18×48	.....	30×55
35	235	40	86×115	112	.....	20×56	.....	26×70
36	250	3	44×82	38	.....	12×40	.....	16×58
37	190	6	45×86	54	.....	13×38	.....	17×47
38	235	5	56×82	38	.....	16×42	.....	20×60
39	200	12	56×72	62	.....	20×42	.....	33×58
40	155	35	60×84	65	4	24×54	15	24×52
41	160	12	56×80	50	.....	17×50	.....	30×55
42	120	46	43×58	80	.....	20×50	.....	26×50
43	140	38	45×70	82	.....	22×42	.....	31×48
44	195	6	48×82	50	.....	16×48	.....	20×60
45	180	38	76×86	70	.....	20×48	6	30×46
46	160	10	56×90	43	.....	18×48	.....	26×56
47	130	40	49×68	52	4	23×46	22	35×42
48	210	8	70×78	18	.....	18×44	6	38×44
49	255	4	62×74	34	.....	15×40	.....	37×46
50	10	70	68×85	122	.....	24×55	.....	30×55
51	55	135	52×78	210	.....	24×54	.....	33×57
52	210	4	60×58	26	.....	15×42	.....	27×38
53	110	56	34×60	102	.....	16×42	.....	38×44
54	185	12	58×86	45	.....	20×52	10	28×42
55	235	2	62×72	48	.....	15×34	.....	25×45
56	260	.....	93×117	56	.....	17×43	.....	32×55
57	270	.....	87×105	43	.....	20×49	.....	37×66
58	190	4	55×76	26	.....	16×42	4	24×40
59	165	6	68×68	32	.....	24×44	6	38×40
60	54	36	30×50	64	.....	20×42	8	22×38
61	58	6	33×48	10	.....	12×28	6	15×18
62	80	4	47×58	3	.....	15×34	4	18×28
63	30	12	52×54	2	.....	14×37	12	15×20
64	16	42	22×30	44	4	15×26	8	15×24
65	75	34	42×50	66	.....	18×34	4	16×30

Color of petal.	Length of filament.	Color of filament.	Length of anther.	Color of anther.	Length of ovary.	Color of ovary.	Length of style.	Color of style.	
white	8	white	12	white	8	white	10	white	note.
white	6	white	10	white	5	white	5	white	
white	10	white	12	white	10	white	10	white	
white	8	white	7	white	5	white	5	white	
white	8	white	10	white	8	white	8	white	
white	9	white	9	white	8	white	10	white	
white	8	white	10	white	8	white	8	white	
white	9	white	10	white	6	white	6	white	
white	10	white	10	white	9	white	6	white	
white	6	lt. gr.	12	white	8	white	8	white	
white	8	lt. gr.	14	white	10	white	10	white	
white	7	lt. gr.	8	lt. gr.	7	white	4	white	
white	7	lt. gr.	8	lt. gr.	4	white	6	white	
white	8	lt. gr.	14	lt. gr.	10	white	10	white	
white	8	lt. gr.	12	lt. gr.	6	lt. gr.	9	lt. gr.	note.
white	8	white	8	white	5	white	5	white	note.
white	8	white	8	lt. gr.	6	white	6	white	note.
gr. c., m. wh	14	lt. gr.	14	lt. gr.	18	green	22	green	
gr. c., m. wh	5	lt. gr.	8	lt. gr.	4	green	5	green	
gr., ed. wh. dis	9	lt. gr.	10	lt. gr.	8	green	10	green	
green	7	lt. gr.	10	green	12	green	12	green	
gr., m. wh. dis	10	lt. gr.	12	lt. gr.	7	lt. gr.	10	lt. gr.	note.
gr. pr., wh. dis	11	lt. gr.	9	lt. gr.	8	green	8	lt. gr.	
gr. c. 10, 14, 18 wide	10	lt. gr.	15	lt. gr.	10	lt. gr.	20	white	
gr. c. 12, 14, 22	11	lt. gr.	11	lt. gr.	7	lt. gr.	14	white	note.
note	note	green	note	green					note.
gr., ed. wh. dis.	5	lt. gr.	12	lt. gr.	6	green	9	green	note.
gr., m. wh. dis	8	lt. gr.	8	lt. gr.	5	green	7	green	note.
gr., m. wh. dis	14	lt. gr.	10	lt. gr.	8	green	20	green	note.
gr. c. 5×36	8	white	9	white	5	white	9	white	note.
gr. m. wh	12	lt. gr.	10	lt. gr.	12	green	24	green	note.
gr., m. wh. dis	10	lt. gr.	10	lt. gr.	10	green	12	green	note.
gr. c. 8×45	10	lt. gr.	10	lt. gr.	9	lt. gr.	16	lt. gr.	
gr. c. 16×54	10	white	11	white	8	lt. gr.	14	lt. gr.	
gr. c. 2×18 dis	11	white	12	lt. gr.	6	lt. gr.	14	white	
gr. c. 1×20.	10	white	8	lt. gr.	4	white	6	white	note.
gr. c. 2×30	7	white	5	lt. gr.	4	lt. gr.	5	white	note.
gr. c. 16×42	10	lt. gr.	10	lt. gr.	6	green	14	lt. gr.	
gr. c. 4×32	8	white	10	lt. gr.	5	lt. gr.	13	white	
gr., b. wh. dis	11	lt. gr.	10	lt. gr.	10	green	12	lt. gr.	
gr. c. 12×35	10	white	10	lt. gr.	8	lt. gr.	12	white	
gr. c. 5×32	7	lt. gr.	9	green	5	lt. gr.	10	lt. gr.	
gr. c. 5×32	8	lt. gr.	10	lt. gr.	4	lt. gr.	10	white	
gr. c. 4×35	10	lt. gr.	9	lt. gr.	6	lt. gr.	9	white	
gr., b. wh. dis	12	green	12	lt. gr.	5	green	11	lt. gr.	
gr. c. 4×35	10	white	9	lt. gr.	6	white	7	white	
gr., m. wh	14	green	9	green	16	green	14	green	
gr. c. 26×34	7	green	9	green	8	green	12	green	
gr. c. pr. 14×13	11	lt. gr.	7	lt. gr.	4	green	6	lt. gr.	note.
gr. c. 3×24	10	lt gr.	10	green	8	green	12	lt. gr.	
gr. c. 10×50	10	lt. gr.	10	green	7	green	11	lt. gr.	
gr., b. wh	2	green			5	green	9	green	
gr. c. 14×42	8	lt. gr.	8	green	4	green	11	lt. gr.	
gr., ed. wh	9	lt. gr.	7	green	7	green	7	lt. gr.	
gr. c. 16×24	10	lt. gr.	10	green	5	green	9	lt. gr.	note.
gr. c. 28×38	8	lt. gr.	10	lt. gr.	5	lt. gr.	11	lt. gr.	
gr. c. dis. 2×13	10	lt. gr.	12	lt. gr.	6	lt. gr.	12	white	
green	9	lt. gr.	7	green	7	green	12	green	
green	11	lt. gr.	14	green	10	green	14	green	
gr., b. wh. dis	10	lt. gr.	6	green	8	green	10	green	
gr., ed. wh. dis	2	green			4	green	4	green	
gr., b. wh. dis	2	green			3	green	4	green	
gr., ed. wh. dis	1	lt. gr.			5	green	8	green	
gr., ed. wh. dis	2	lt. gr.			4	green	6	green	
gr, ed. wh. dis	5	lt. gr.	7	green	6	green	4	green	note.

Number.	Length of stem.	Length of petiole.	Size of leaf blade.	Length of peduncle.	Length of sepal stem.	Size of sepal blade.	Length of petal stem.	Size of petal blade.
66	170	6	98×88	46	.....	22×54	8	44×50
67	170	8	68×74	40	.....	19×46	4	32×42
68	130	10	62×64	40	.....	22×46	8	29×38
69	140	6	68×70	24	.....	19×47	8	34×44
70	140	6	54×68	6	.....	17×38	4	32×38
71	60	.....	spurs	112	....	24×54	6	32×46
72	165	2	54×85	40	.....	14×42	4	22×40
73	210	22	54×70	78	.....	20×50	.....	26×60
74	185	8	57×75	65	.....	20×46	.....	28×50
75	280	... ...	100×108	53	.....	22×46	.. ....	42×56
76	250	2	95×115	56	.....	24×54	.....	45×60
77	210	2	102×128	34	.....	20×58	2	44×55
78	180	4	95×82	45	.. .. ..	22×48	.....	50×52
79	235	8	56×80	60	.....	16×42	....	29×50
80	185	8	54×75	40	.....	15×44	10	22×40
81	200	8	76×80	48	.....	20×52	4	40×44
82	225	2	56×62	13	.... ..	17×36	4	25×30
83	290	10	85×108	54	.....	28×72	....	46×80
84	100	2	54×40	17	.....	16×27	... .	25×25
85	180	2	65×95	44	.....	13×50	.. ..	28×49
86	180	5	60×90	44	.....	16×50	4	26×46
87	140	36	52×76	42	2	18×46	14	18×39
88	60	42	37×58	58	.....	15×38	12	15×36
89	175	2	54×78	36	.. ....	16×44	.....	29×38
90	120	32	52×68	78	.....	17×38	....	20×42
91	90	125	85×110	192	.....	44×78	8	42×70
92	1	140	64×70	182	.....	28×44	4	20×36
93	165	16	64×66	10	2	22×46	16	31×40
94	70	100	66×74	152	.....	28×50	4	31×50
95	2	... .	spurs	115	12	28×44	22	21×35
96	5	.....	spurs	170	.....	28×56	10	32×50
97	90	34	35×56	52	8	18×44	20	28×42
98	65	36	50×66	54	6	19×44	20	22×37
99	75	60	52×70	67	22	22×48	34	31×45
100	110	30	48×62	46	6	20×49	17	27×40
101	190	6	74×78	25	.....	11×50	6	31×41
102	195	6	75×100	29	.. .. ..	20×56	4	34×50
103	5	.....	spurs	140	24	32×67	48	40×56
104	120	36	42×58	38	4	22×42	16	25×37
105	100	8	44×50	6	4	18×40	14	30×30
106	125	48	54×68	27	23	30×55	45	26×44
107	80	8	30×48	6	2	12×32	10	16×28
108	175	5	65×66	42	.....	26×46	3	36×46
109	25	110	40×58	88	21	27×50	35	23×40
110	70	60	56×70	82	10	26×52	34	33×60
111	.....	130	83×90	150	8	35×64	38	41×54
112	8	60	36×52	90	6	25×44	14	20×40
113	95	64	55×76	74	8	25×56	26	22×46
114	155	50	74×94	36	14	28×64	37	40×52
115	125	80	66×80	112	4	27×52	12	36×52
116	130	44	66×66	64	6	26×50	26	36×46
117	105	46	67×80	72	5	26×55	24	38×55
118	100	30	48×60	45	4	19×40	20	28×40
119	45	73	52×68	94	.....	25×48	12	34×45
120	225	44	58×78	44	10	27×50	28	22×44
121	65	83	59×69	33	44	33×59	64	36×52
122	14	117	47×60	94	36	27×52	46	28×45
123	8	110	28×50	140	2	18×40	8	12×32
124	8	100	60×76	100	18	20×55	42	33×50
125	60	75	52×58	66	8	26×36	25	23×40
126	70	58	40×58	87	2	18×40	8	14×30
127	235	.....	110×135	75	.. ....	22×52	.....	45×68

Color of petal.	Length of filament.	Color of filament.	Length of anther.	Color of anther.	Length of ovary.	Color of ovary.	Length of style.	Color of style.	
gr., lt. wh.	12	lt. gr.	12	green	8	lt. gr.	16	green	
gr., ed. wh	8	lt. gr.	10	green	7	lt. gr.	17	green	note.
gr., ed. wh.	7	green	9	green	9	green	12	green	
gr., b. wh.	14	green	10	green	7	green	15	green	
gr. c. pr. 26×28	4	green	6	green	7	green	6	lt. gr.	
gr. c. 20×40	10	lt. gr.	8	lt. gr.	8	green	14	green	note.
gr., ed. wh.	8	green	11	green	7	green	12	green	
note.	12	white	9	lt. gr.	6	green	12	white	note.
note	9	white	8	lt. gr.	4	white	6	white	note.
gr. c. 30×40	10	white	12	lt. gr.	6	lt. gr.	16	white	
gr. c. 36×52	12	lt. gr.	14	lt. gr.	12	lt. gr.	18	lt. gr.	
gr., ed. wh.	8	lt. gr.	12	green	6	lt. gr.	16	green	
gr. c. 30×50	10	lt. gr.	14	lt. gr.	10	green	20	green	
gr. c. 4×30	10	white	10	lt. gr.	6	lt. gr.	10	white	
gr., ed. wh. dis.	8	lt. gr.	10	green	6	green	14	green	
gr. c. pr. 30×28	5	lt. gr.			6	lt. gr.	10	green	
gr., ed. wh. dis.	1	lt. gr.			4	lt. gr.	4	lt. gr.	
gr. c. pr. 22×45	14	lt. gr.	16	lt. gr.	14	green	20	green	
gr., ed. wh. dis.	2	lt. gr.			3	lt. gr.	5	lt. gr.	
gr., ed. wh.	8	lt. gr.	11	green	5	lt. gr.	16	green	
gr., ed. wh.	10	lt. gr.	10	green	8	lt. gr.	14	green	
gr., ed. wh. dis.	1	lt. gr.			10	lt. gr.	8	green	
gr., ed. wh.	11	green	8	green	8	green	8	green	
gr., ed. wh.	7	green	15	green	6	lt. gr.	12	green	
gr. c. 2×10	7	white	7	lt. gr.	4	green	5	lt. gr.	
gr., m. wh.	10	white	10	lt. gr.	12	lt. gr.	18	lt. gr.	
gr. c. 8×34	8	white	7	lt. gr.	3	lt. gr.	3	lt. gr.	note.
gr. b. wh. dis.	1	green			7	green	15	green	
gr. c. 15×36	10	lt. gr.	8	green	10	green	12	lt. gr.	
gr., b. wh. dis	6	green			5	green	5	green	
gr., ed. wh.	12	lt. gr.	10	green	9	green	17	green	
gr., b. wh. dis	10	green	10	green	8	green	12	green	
gr., b. wh. dis	14	lt. gr.	8	green	12	green	10	green	
gr., b. wh.	18	lt. gr.	10	green	14	green	14	green	
gr., ed. wh. dis.	10	lt. gr.	11	green	12	green	12	green	
green	4	green			5	green	10	green	
green	14	green	10	green	9	green	13	green	
gr., ed. wh. dis	16	lt. gr.	12	green	30	green	16	green	
green	9	green	7	green	8	green	8	green	note.
green	2	green			8	green	14	green	
green									note.
gr., b. wh. dis	2	green			3	green	6	green	
gr., b. wh.	8	green	10	green	8	green	14	green	note.
green	12	lt. gr.	8	green	15-5	green	18	green	note
gr., m. wh. dis	18	lt. gr.	8	lt. gr.	12-6	green	16	green	
gr., b. wh. dis	18	green	14	green	14-6	green	24	green	note.
gr., b. wh. dis	10	lt. gr.	8	green	5-6	lt. gr.	12	green	
gr., ed. wh. dis.	14	green	10	green	14-6	green	22	green	
gr., ed. wh. dis.	14	lt. gr.	13	green	16-10	green	22	green	
gr., b. wh. dis	12	lt. gr.	14	green	7-13	green	13	lt. gr.	
gr., b. wh. dis	18	green	11	green	10-8	green	22	green	
gr., b. wh. dis	15	lt. gr.	12	green	7-6	green	18	lt. gr.	
gr., m. wh. dis	16	green	8	green	9-5	green	12	green	
gr., b. wh. dis	11	lt. gr.	9	green	10-5	green	15	green	
green	14	lt. gr.	8	lt. gr.	10-6	green	16	green	note.
gr., b. wh. dis	34	green	10	green	23-10	green	27	green	note.
gr. pr., wh. dis.		note			15-5	green	13	green	note.
gr., ed. wh. dis.	10	green	6	green	4-4	green	7	green	note.
gr., ed. wh. dis.		note			16-8	green	20	green	note.
green	3	green			8-8	green	16	green	
green	3	green	5	lt. gr.	5-5	green	6	green	
gr. c. 2×68	6	lt. gr.	10	lt. gr.	10	white	8	white	note.

Number.	Length of stem.	Length of petiole.	Size of leaf blade.	Length of peduncle.	Length of sepal stem.	Size of sepal blade.	Length of petal stem.	Size of petal blade.
128				135		25×44	5	22×34
129	230	2	80×90	60		16×41		32×50
130	330		124×155	85		18×56		34×76
	300		120×145	85		19×49		40×74
131	305		93×130	70		19×50		37×62
	305		78×125	60		18×48		32×64
132	275		76×100	46		15×39		36×56
	285		70×120	56		14×46		28×62
133	255		80×115	56		12×46		22×64
	245		80×110	60		14×45		38×64
134	115	44	60×68	84		20×44	4	26×42
	1	105	56×70	90	28	34×56	46	40×46
135	125	8	52×66	24		19×46	8	27×37
	115	20	46×60	26		19×44	8	22×36
136	125	20	31×42	38		15×36	4	14×34
	120	14	62×66	17	4	24×52	16	36×44
137	95	26	54×70	10		21×53	12	32×52
	35	16	64×76	3		16×38		34×42
138	155	34	44×75	80		20×45		24×46
	110	50	36×60	33		22×46	4	26×42
139	110	14	32×50	52		14×35		19×40
	145	8	42×60	48		12×38		17×44
140	95	60	60×70	102	4	30×52	12	33×45
	60	75	45×60	115	4	28×48	16	28×42
141	75	110	35×66	147		23×46	26	21×44
			spurs	170	10	23×54	38	29×40
142	80	40	33×54	83		20×44	5	20×44
	115	35	40×70	75		20×48	5	28×45
143	150	12	46×84	55		16×44		14×50
	50	70	37×74	110		17×46		13×44
144	155	12	40×66	56		9×34		12×40
	25	95	30×53	140		14×34	4	15×34
145	85	40	37×60	85		16×38	4	26×40
	4		spurs	144		17×34	6	23×34
146	20		spurs	115		22×46	6	26×40
	120	12	50×68					
147	12	120	33×48	164		22×43	6	24×40
	4	142	42×54					
148			spurs	85	12	31×52	28	21×40
			spurs	70	25	31×49	36	20×38
149	2		spurs	135	4	20×40	10	20×38
	70	36	38×52					
150	210		92×115	44		18×46		42×61
	210	8	60×82	36		15×44		30×48
151	8		spurs	155		20×40		30×40
				170		23×36		27×38
152	140		31×56			26×50		
	130		33×50			30×48		18×32
153	250		80×93	54		20×46		43×58
	245		75×88	43		18×46		40×56
154	135	42	62×76	95		25×48		33×50
	7		spurs	165		42×64	8	42×50
155	130	57	62×76	120		22×52		30×48
	122	14	47×50	42		20×44		18×33
156	155	5	50×62	26		17×36		32×44
	120	25	43×60	32	2	18×38	12	30×35
157	170	44	54×84	90		22×50		32×54
	110	70	39×70	107		28×58	12	34×52
158	205	16	70×95	71		20×54		37×66
	115		22×40					
159	180	4	60×66	32		15×34		32×46
	170	4	50×56	36		12×30		22×38

Color of petal.	Length of filament.	Color of filament.	Length of anther.	Color of anther.	Length of ovary.	Color of ovary.	Length of style.	Color of style.	
gr., b. wh. dis	12	lt. gr.	8	lt. gr.	.....	note	. ...	.....	note.
white	6	lt. gr.	9	white	5	white	7	white	note.
white	9	white	12	white	12	white	12	white	note.
white .	8	white	12	white	10	white	10	white	
white	9	white	12	white	8	white	10	white	
white	8	white	12	white	8	white	8	white	
white	8	white	12	white	8	white	10	white	
white .	8	white	10	white	7	white	9	white	
white	8	white	10	lt. gr.	6	white	10	white	
white	8	white	10	lt. gr.	6	white	10	white	
gr., ed. wh	10	white	8	lt. gr.	6	lt. gr.	6	lt. gr.	
gr., ed. wh. dis	20	lt. gr.	12	lt. gr.	20	lt. gr.	14	lt. gr.	
green	2	green	... ..	.....	8	green	14	green	
green	2	green	.....	.....	8	green	12	green	
gr., ed. wh. dis	2	lt. gr.	.....	.....	.....	.....	.....	.....	
gr., ed. wh. dis.	2	lt. gr.	.. ...	.....	10	green	14	green	
gr., b. wh. dis	2	lt. gr.	.....	.....	2	lt. gr.	8	lt. gr.	
gr., m. wh. dis	.....	... .	.....	..... .	4	lt. gr,	6	lt. gr.	
gr. c. 12×32	8	white	7	lt. gr.	5	lt. gr.	9	lt. gr.	
gr., b. wh. dis	8	white	6	lt. gr.	5	lt. gr.	10	lt. gr.	
gr. c. 3×18	7	white	8	white	4	lt. gr.	6	white	
white	7	white	8	lt. gr.	4	lt. gr.	6	white	
gr., b. wh. dis	9	lt. gr.	10	lt. gr.	12	green	12	lt. gr.	
gr., m. wh. dis	12	lt. gr.	9	lt. gr.	12	green	16	lt. gr.	
gr., b. wh. dis	11	lt. gr.	9	green	7	green	7	green	note.
gr., ed. wh. dis	23	lt. gr.	10	green	18	green	12	green	
gr. c. 12×44	9	lt. gr.	9	lt. gr.	6	green	14	lt. gr.	
gr. c. 16×44	8	lt. gr.	8	lt. gr.	6	green	16	lt. gr.	
gr. c. 2×50	7	lt. gr.	7	white	3	green	3	lt. gr.	
gr. 2×42	6	lt. gr.	6	white	4	green	2	lt. gr.	note.
white .	6	white	6	lt. gr.	3	white	3	white	note.
gr. c. 2×12	7	lt. gr.	8	lt. gr.	4	lt. gr.	6	white	
gr. c. 12×36	8	lt. gr.	8	white	6	lt. gr.	8	lt. gr.	
gr., b. wh	8	lt. gr.	8	white	6	green	8	lt. gr.	
gr., m. wh	10	lt. gr.	10	lt. gr.	8	green	10	green	note.
.....	.....	... ...	.....	... ...	.....	... ...	.....	.....	
gr., ed. wh. dis	8	white	8	lt. gr.	4-4	green	8	lt. gr.	note.
.....	...	.....	.....	.....	.....	... .	.....	.....	
green	4	lt. gr.	6	lt. gr.	.....	.....	.....	.... .	note.
green	5	green	5	green	.....	.....	.....	.....	
green	6	green	7	green	6	green	6	green	note.
.....	.....	.... ..	.....	.....	.....	.....	....	.....	
gr., b. wh	10	lt. gr.	12	green	8	lt. gr.	20	lt. gr.	
gr., b. wh.	9	lt. gr.	9	green	8	lt. gr.	12	lt. gr.	
gr. c. 12×34	8	lt. gr.	7	green	8	green	8	green	note.
gr. c. 12×32	7	lt. gr.	8	green	8	green	2	white	
note.	6	lt. red	6	green	.....	.....	.....	... ...	note.
red and green	4	red	6	red	.....	... .	.....	.. ..	
gr. c. 28×40	12	lt. gr.	13	lt. gr.	6	lt. gr.	18	lt. gr.	
gr. c. 25×45	10	lt. gr.	13	lt. gr.	8	lt. gr.	16	lt. gr.	
gr. c. 20×45	10	lt. gr.	10	green	8	green	14	green	
gr. c. 30×42	11	green	11	green	4	green	12	green	
gr. c. 16×35	9	green	12	green	8	green	17	green	
gr., ed. wh	4	green	10	lt. gr.	6	green	14	green	
gr., ed. wh	8	green	11	green	6	green	14	green	
gr., ed. wh	14	green	10	green	10	green	12	green	
gr. c. 12×42	10	white	10	green	8	green	14	lt. gr.	
gr. c. 20×49	11	lt. gr.	11	green	8	green	17	lt. gr.	
gr. c. dis. 5×28	10	lt. gr.	10	green	6	green	20	white	
.....	.....	.....	.....	...	.....	.....	.....	.....	
gr. c. 2×12	8	lt. gr.	8	green	6	green	8	lt. gr.	
gr. c. 12×26	7	lt. gr.	6	green	3	lt. gr.	5	lt. gr.	

Number.	Length of stem.	Length of petiole.	Size of leaf blade.	Length of peduncle.	Length of sepal stem.	Size of sepal blade.	Length of petal stem.	Size of petal blade.
160	115	46	36×56	78	... .	19×43	4	21×41
	85	60	34×50	80	.....	18×40	8	14×34
161	160	12	41×65	50	.....	14×35	.....	20×38
	115	30	32×53	60	.....	16×36	4	21×33
162	190	.....	70×80	32	.... ..	22×48	2	38×44
	50	.....	74×76	4	... .	12×28	.....	.....
163	90	80	60×75	96	2	23×48	8	40×40
	8	160	55×65	180	10	30×46	30	43×40
164	55	38	38×44	36	8	21×36	20	20×32
	42	58	42×48	.....	.....	.....	.....	.....
165	90	40	32×50	66	... ..	16×34	4	15×34
	54	50	32×48	61	4	15×32	10	16×30
166	1	100	33×47	138	.....	15×34	8	20×32
	....	100	40×50	.....	.....	.....	.....	.....
167	125	42	38×60	66	.....	14×32	2	8×26
	115	38	46×54	.....	.....	.....	.....	.....
168	80	28	31×54	67	.....	16×40	....	22×46
	1	.....	spurs	145	.....	22×44	4	23×40
169	110	25	30×50	52	.... ..	12×34	4	16×34
	80	40	30×48	39	5	16×34	14	16×30
170	44	96	42×55	113	6	19×38	20	23×34
	40	80	38×58	108	8	19×36	20	20×30
171	120	58	58×70	103	... .	22×48	5	32×48
	45	110	50×68	143	4	24×42	14	32×40
172	40	105	50×74	133	2	25×50	10	30×38
	2	.....	spurs	220	.....	25×50	4	35×48
173	155	10	70×65	20	.....	25×52	10	42×46
	105	15	74×64	2	.....	22×38	14	34×40
174	160	20	54×60	40	.....	20×46	16	27×38
	145	20	60×66	42	2	20×50	12	32×42
175	70	40	note	64	....	16×39	4	20×30
	10	90	38×52	.....	.....	.....	.....	.....
176	2	.....	spurs	200	2	26×56	10	36×44
	2	.....	spurs	156	8	31×56	20	30×43
177	1	100	34×50	145	.....	20×40	4	19×40
	.....	93	33×40	118	4	19×37	15	18×34
178	10	115	65×65	74	25	30×60	42	40×46
	....	90	40×55	72	12	28×46	26	35×40
179	160	42	48×72	64	.....	19×50	6	29×44
	160	38	42×70	54	... ...	19×45	8	22×38
180	.....	105	40×65	130	8	25×48	22	26×42
	.....	.....	spurs	188	....	25×50	4	31×48
181	225	.....	85×112	74	.....	23×58	.....	38×76
	233	....	70×100	48	.....	15×52	.....	30×62
	235	....	86×120	70	.....	22×58	.....	44×80
182	330	.....	103×107	46	.....	26×54	.....	44×60
	335	6	88×94	36	... .	26×52	.....	38×52
	332	. .....	103×105	55	.....	27×56	.... ..	40×64
183	.....	85	36×46	.....	.....	.....	... ..	.....
	40	70	54×74	115	.....	13×40	.....	20×46
	1	....	spurs	142	....	17×40	....	30×50
184	66	44	36×42	70	.....	15×35	8	17×30
	70	44	34×46	.....	.....	.....	....	.....
	60	44	32×44	.....	.....	.....	.....	....
185	325	.....	98×127	95	.....	23×52	.....	36×56
	320	.....	100×130	100	.. ..	37×56	... .. .	35×60
	325	.....	93×135	85	.....	21×58	.....	....

Color of petal.	Length of filament.	Color of filament.	Length of anther.	Color of anther.	Length of ovary.	Color of ovary.	Length of style.	Color of style.	
gr., ed. wh	11	lt. gr.	10	green	8	green	10	green	
gr. pr., m. wh. dis	10	green	10	green	10	green	8	green	
gr. c. 6×34	8	lt. gr.	7	lt. gr.					
gr. c. 18×30	10	lt. gr.	8	green	7	green	5	green	
gr., ed. wh	14	lt. gr.	11	green	9	green	15	green	
gr., m. wh. dis									
gr., b. wh. dis	13	lt. gr.	12	green	12	green	14	green	
green	10	green	20	green	15	green	15	green	note.
gr., b. wh. dis	6	green	7	green					note.
gr., ed. wh. dis	10	green	8	green	8	green	6	green	
gr. pr., wh. dis	8	lt. gr.	6	lt. gr.	2	white	4	white	note.
gr. pr., wh. dis									
gr. c. 10×40	8	white	10	lt. gr.	5	green	10	lt. gr.	
gr. c. 12×34	8	white	10	lt. gr.	4	green	12	lt. gr.	
gr., ed. wh	7	lt. gr.	5	green	6	green	4	lt. gr.	
gr., m. wh. dis	10	green	6	green					
gr., b. wh. dis	12	lt. gr.	11	lt. gr.	10	green	8	lt. gr.	
gr., b. wh. dis	14	green	10	green	10	green	10	lt. gr.	
gr. c. 22×42	10	lt. gr.	9	green	6	green	12	green	
gr. c. 30×40	10	lt. gr.	10	green	7	green	13	green	
gr., ed. wh. dis.	2	lt. gr.			14	green	11	green	
gr., b. wh. dis	12	lt. gr.	10	green	8	green	18	green	
gr., ed. wh. dis	2	lt. gr.			10	green	14	green	
gr., ed. wh. dis					5	lt. gr.	5	lt. gr.	
gr., b. wh. dis	8	lt. gr.	14	lt. gr.	5-5	green	12	green	
gr., b. wh. dis	12	lt. gr.	12	green	10	green	12	green	
gr., ed. wh. dis	5	green	6	green	3-6	green	9	green	note.
gr., ed. wh. dis	8	lt. gr.	10	green	14	green	12	green	
gr., b. wh. dis	10	lt. gr.	10	green	4-10	green	18	green	note.
gr., b. wh. dis	8	lt. gr.	6	green	8	green	5	green	
gr., ed. wh. dis	8	lt. gr.	7	green	5-5	green	10	green	note.
gr., b. wh. dis		note			18-12	green	18	green	
gr., ed. wh. dis	2	green			14	green	12	green	note.
gr., b. wh. dis	10	lt. gr.	8	green	5-4	green	12	green	
gr., b. wh. dis	10	lt. gr.	7	green	4-4	green	13	green	
gr., ed. wh. dis	10	green	9	green	8-6	green	14	green	
gr., b. wh. dis	11	lt. gr.	11	green	5-7	green	16	green	
white	8	lt. gr.	14	white	10	white	9	white	
white	8	lt. gr.	12	white	8	white	8	white	
white	10	lt. gr.	14	white	10	white	10	white	
gr. c. 34×50	11	white	13	lt. gr.	10	lt. gr.	18	lt. gr.	
gr. c. 30×48	10	white	10	lt. gr.	10	lt. gr.	18	white	
gr. c. 36×50	10	white	14	lt. gr.	10	lt. gr.	18	white	
gr. c. 2×16	7	white	8	lt. gr.	4	lt. gr.	6	lt. gr.	
gr. c. 4×35	8	white	8	lt. gr.	5	green	10	lt. gr.	
gr., ed. wh. dis	8	lt. gr.	6	green	1	green	5	green	
									note.
white	8	lt. gr.	14	lt. gr.	10	white	8	white	note.
note	8	lt. gr.	14	lt. gr.	12	white	8	white	note.
note	8	lt. gr.	14	lt. gr.	12	white	8	white	note.

PLATE VIII.

Fig. 17. A photograph showing trilliums growing in the woods.

PLATE VIII.

FIG. 17.

PLATE IX.

Fig. 18. 13. A typical plant of *Trillium grandiflorum* with narrow-petaled flower.

12. A typical plant with broad-petaled flower and broad leaves, which usually accompany such flowers.

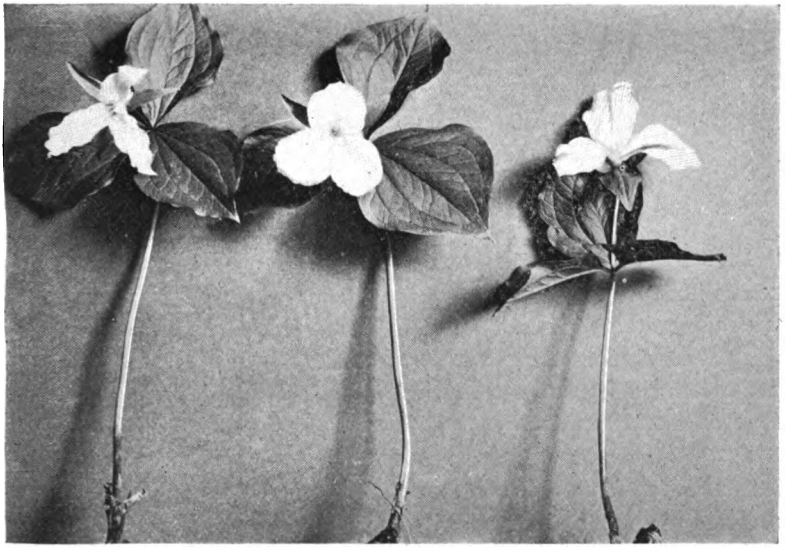
30. A plant varying from the typical ones by having short-petioled leaves, broadened sepals, petals marked with green and the "cup" formed by the bases of the petals more open than normally. One petal is entirely white, one has a slight trace of green along the centre distally and the third has a green centre stripe 3 mm. wide.

Fig. 19. 15. A plant with petioled leaves and normal flower parts, the "cup" formed by the bases of the petals showing in side view.

23. A plant with short-petioled leaves and with the proximal or basal portions of the petals narrowed into stems. The petals are green proximally, one of them to a lesser extent than the other two.

22. A plant with long-petioled leaves and stemmed petals.

PLATE IX.



13 12 30

FIG. 18.

15 23 22

FIG. 19.

PLATE X.

Fig. 20. 110. A plant with petioled leaves, short-stemmed sepals, long-stemmed petals, ovary raised on a stalk and stamens with elongated filaments. Petals white-margined distally.

27. A dwarf plant with short-petioled leaves and short peduncle which brings the flowers close to the leaves. Petals short-stemmed and narrowly white-edged distally.

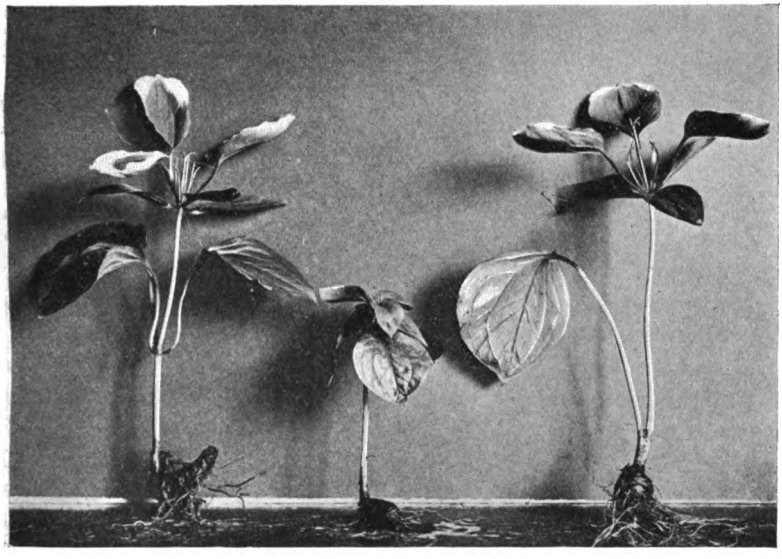
111. A stemless plant with one long-petioled broad-bladed leaf arising from the rootstock, the other two leaves being reduced to short spurs or points. The sepals are short-stemmed and broad-bladed; the petals long-stemmed, broad-bladed and white-bordered distally, the ovary is stalked and the styles are much elongated.

Fig. 21. 21. A plant in which the petioles, peduncle and petal stems are all short and all the parts are green.

109. A short-stemmed plant with long-petioled leaves, long-stemmed sepals and petals and stalked ovary with elongated styles. All parts of the plant are green.

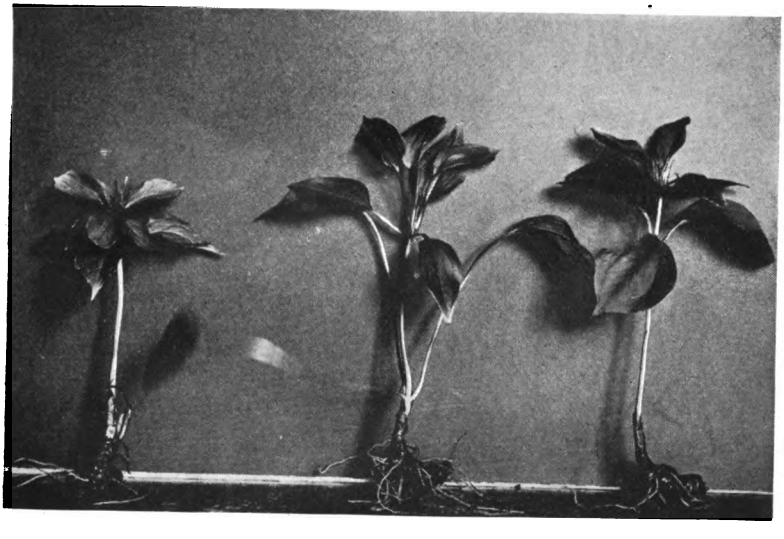
20. A long-stemmed plant with petioled leaves, short-stemmed sepals and long-stemmed petals, which are white-edged distally.

PLATE X.



110 27 111

FIG. 20.



21 109 20

FIG. 21.

PLATE XI.

Fig. 22. 32. A plant in which the leaves are reduced to spurs 3 mm. long, the plant stem being 60 mm. long. The broad sepals are sessile and the petals are stemmed. Two petals are distally broadly margined with white, while the third is merely white-bordered distally.

28. A plant with stem 18 mm. long and one long-petioled leaf, the other two being reduced to spurs 2 mm. long. The sepals are sessile and the petals have stems 3 mm. long and are broadly margined with white distally.

29. A plant with stem only 2 mm. long, the leaves being reduced to small spurs close to the rootstock. The sepals are sessile and the petals moderately long-stemmed.

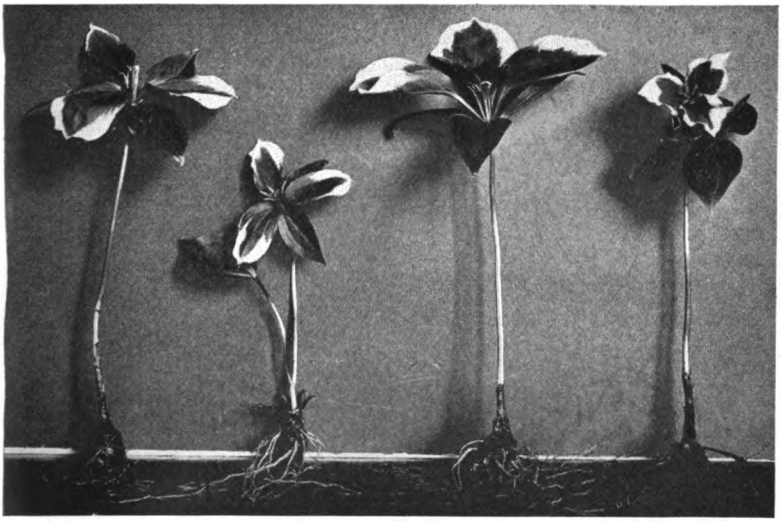
19. A plant with leaves nearly sessile and with sessile sepals and petals.

Fig. 23. 148. A plant with two flower scapes, in each of which the leaves are reduced to spurs at the tip of the rootstock. In each scape the sepals and petals are stemmed and the pistil aborted. The petals are all green.

31. A stemless plant, the leaves being reduced to spurs at the tip of the rootstock. The sepals are sessile, the petals are stemmed and white-margined and the styles are elongated.

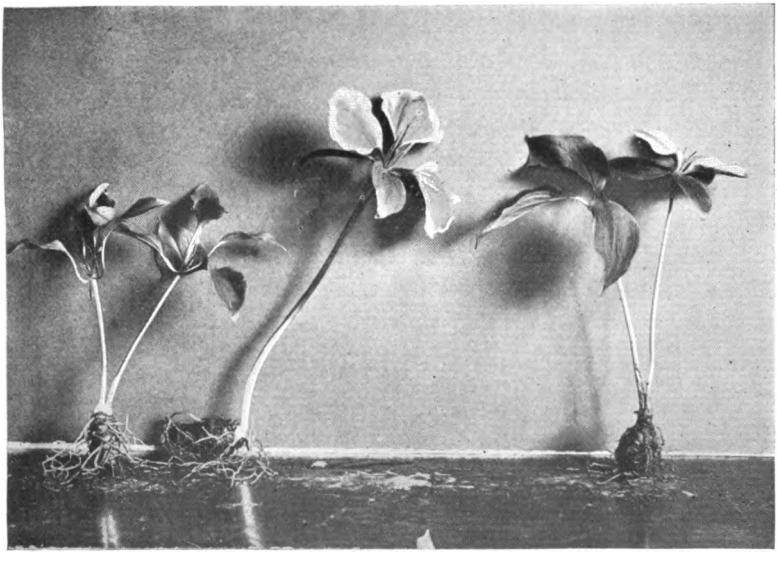
146. A two-stemmed plant in which one stem is long and surmounted by petioled leaves but has no other parts. The other stem is short and has its leaves reduced to spurs 3 mm. long. The sepals are sessile and the petals short-stemmed and white-margined.

PLATE XI.



32 28 29 19

FIG. 22.



148 31 146

FIG. 23.

PLATE XII.

Fig. 24. 26. A plant with long-petioled leaves and with stemmed sepals and petals, one of the latter of which is shorter-stemmed and smaller-bladed than the other two. Two stamens are aborted and the rest vary in the length of their filaments and anthers.

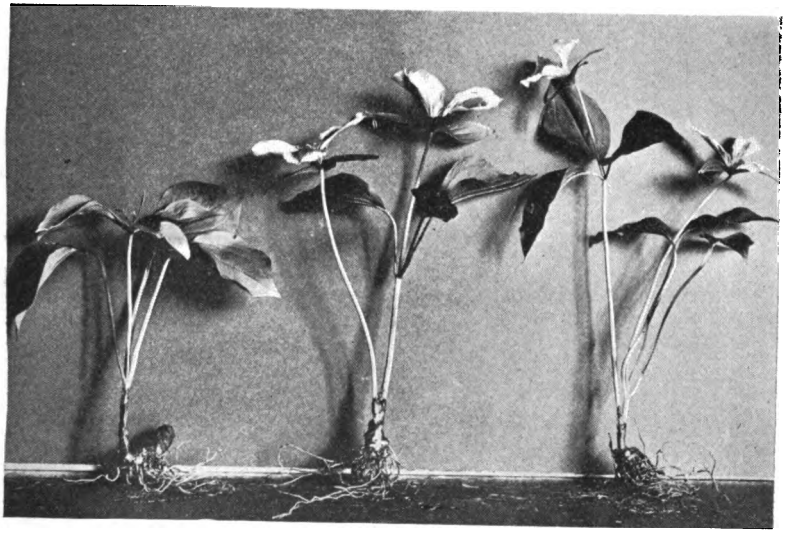
145. A plant with two flowers scapes, one of which has the leaves reduced to spurs at the tip of the rootstock while the other has well developed petioled leaves placed 40 mm. above the root-stock. In both flowers the sepals are sessile and the petals short-stemmed.

144. A two-stemmed plant in which one stem is long and bears short-petioled leaves and a flower having both sepals and petals sessile and the petals entirely white. The other stem is short and bears long-petioled leaves and a flower with sessile sepals and short-stemmed petals, one of which has a green centre stripe while the other two are green proximally and white distally.

Fig. 25. 142. A two-stemmed plant, each stem bearing petioled leaves and green-marked flowers, each with sessile sepals and short-stemmed petals.

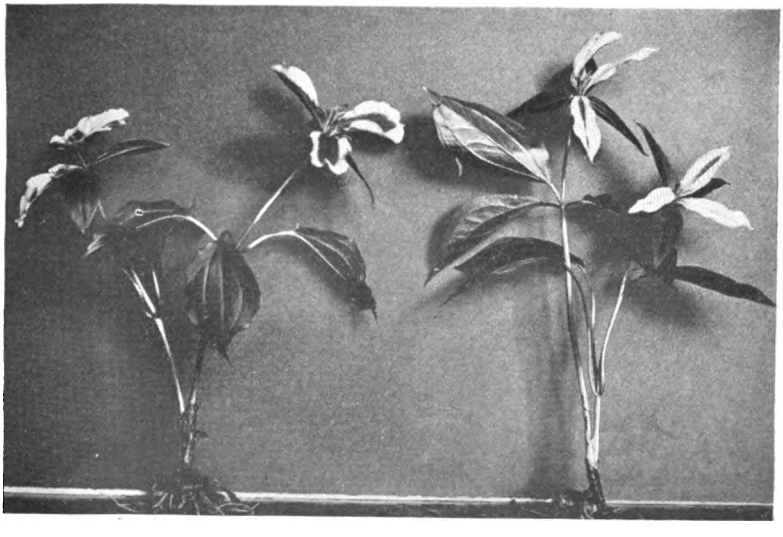
143. A two-stemmed plant, one stem of which is short and bears long-petioled leaves and a flower with sessile sepals and petals, one of which is entirely white, while the other two have green centre stripes. The other stem is long and bears shorter-petioled leaves and a flower with sessile sepals and petals, each petal being marked with a green centre stripe.

PLATE XII.



26 145 144

FIG. 24.



142 143

FIG. 25.

14

PLATE XIII.

Fig. 26. 24. A large-flowered plant with broad sessile leaves and sessile sepals and petals.

25. A large-flowered plant with short-petioled leaves and sessile sepals and petals.

18. A large-flowered plant with longer-petioled leaves, stemmed petals and somewhat elongated stamens and pistil.

PLATE XIII.

25 24 18

FIG. 26.

SUMMARY OF VARIATIONS.

When in full bloom the petals vary in color from typical white or pink, through white with green centre stripe to solid green. Those petals which are entirely green usually persist on the plant regardless of the presence or absence of leaves, and in those which are merely white-margined the green portions usually persist after the white parts have withered. Such persistent petals, the sepals and the leaves, gradually become purplish-brown in color, remaining thus colored until the plant withers to the ground. Usually by the time the carpels of the normal plants have attained their full size all traces of the abnormal plants have disappeared.

The following figures will show the limits of variation in size of the different parts of the plants which have been tabulated:

Length of plant stem varies from	0 mm.	to 340 mm.
Length of petiole	0	160
Width of leaf blade	22	124
Length of leaf blade	30	157
Length of peduncle	2	220
Length of sepal stem	0	44
Width of sepal blade	9	37
Length of sepal blade	26	78
Length of petal stem	0	64
Width of petal blade	8	50
Length of petal blade	18	80
Length of filament	1	34
Length of anther	0	20
Length of ovary	1	30
Length of ovary stalk	0	23
Length of style	2	27